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(54) **HIGH TRANSPARENCY INTEGRATED ENCLOSURE TOUCH SCREEN ASSEMBLY FOR A PORTABLE HAND HELD DEVICE**

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This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**
G09G 5/00 (2006.01)

(52) **U.S. Cl.** **345/173**; 345/175; 349/58

(58) **Field of Classification Search** 345/156–176; 385/12–14; 349/158; 361/681, 729
See application file for complete search history.

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(57) **ABSTRACT**

An integrated enclosure/touch screen assembly. A touch screen assembly consisting of a display mechanism and optical sensor mechanism are enclosed within a single piece cover. The optical sensor mechanism consists of lens structure and optical sensor couple to the lens structure. The single piece cover includes a transparent top surface and the lens structure is embedded within the transparent top surface. The transparent top surface of the single piece cover provides an enclosure that is both dust free and waterproof.

The lens structure of the single piece cover functions by columnating light across the transparent surface. The optical touch sensor is coupled to the lens structure to register contact with the transparent surface via the lens structure by detecting disturbances in the columnated light. In one embodiment, the single piece cover is constructed by embedding the lens structure directly into the transparent surface. This process forms the single piece cover and also may be used to provide various shapes for the outer edges of the cover. The single piece cover eliminates exposed seams of the touch screen assembly. Additionally, the transparent surface is disposed directly above the display without any intervening layers, thereby improving the transmission of light to the display.

20 Claims, 5 Drawing Sheets